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Research collaboration in asymmetric power relations: A study of postgraduate students' views

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Authors:
Judy van Biljon[1] ◉
Samwel Mwapwele[1] ◉

Affiliations:
[1]Department of Information Systems, College of Science, Engineering and Technology, University of South Africa, Johannesburg, South Africa

Corresponding author:
Judy Van Biljon,
Vbiljja@unisa.ac.za

Collaboration among researchers and across disciplinary, organisational and cultural boundaries is essential for addressing the increasingly complex challenges and opportunities facing international development. Despite the known advantages and various incentives, research collaboration within Africa (specifically within South Africa) is lacking. To better understand the reasons for this lack of research collaboration, this study explored collaboration between students and supervisors in an information and communication technology for development (ICT4D) postgraduate student project in South Africa. South Africa, a country with major social inequalities and asymmetric power relations, provides an appropriate context. The students' perspectives provided a space for investigating the collaboration factors by unpacking the capability inputs according to Robeyns' representation of personal capabilities. Data were captured from a survey and focus groups (FG) with students and supervisors in ICT4D from different universities in South Africa. Thematic analysis was used to identify and link the participants' expectations of research collaboration with their perceptions of the challenges of such collaborations. The contribution is a conceptualisation of the main components representing research collaboration viewed in terms of personal capabilities, including the factors that influence collaboration.

Transdisciplinarity contribution: Research collaboration is fundamental to promoting multi-, inter- and transdisciplinary research. The novelty of this study lies in applying a theoretical lens from the field of human development to explore research collaboration in the transdisciplinary field of ICT4D. Given the research application context and the theoretical lens applied, the findings have implications for initiatives and policies on funding transdisciplinary research collaboration.

Keywords: Research collaboration; capabilities; conversion factors; ICT4D, postgraduate students.

Introduction

National and international research collaboration is advocated with a view to maximising scientific research productivity,[1] research impact[2] and global development.[3] The trend towards multi-, inter- and transdisciplinary research is supported by technological advances which create opportunities for researchers to connect and capitalise on a broader range of expertise and information through scientific collaboration.[4] The 2030 Agenda for Sustainable Development, adopted by all the United Nations (UN) member states in 2015,[5] and specifically Goal 17 (which refers to strengthening the means of implementation and revitalising the Global Partnership for Sustainable Development), is one of the key arguments promoting increased collaboration and partnership.[6]

While institutional support is vital for forming an alliance, individual scientists remain the key actors,[7] as human initiatives and capabilities are central to establishing and maintaining successful research collaborations. Collaboration patterns for countries in Africa are not universal but rather explained by history, culture, language and, to a lesser extent, regional geography.[8] Based on these findings, Adams et al.[8] argue for the investigation of bottom-up, subjective, human factors to provide the fuller explanation useful for policy and management purposes.

The potential of research collaboration for human development has been studied to some extent. Examples include the work of Persson[6] on conceptualising collaborative research for sustainable development, that of Bon[9] on rethinking the effects and impact of collaboration versus intervention and that of Cottrell and Parpart[10] for emphasising the challenge of power relations in collaborative research. Walsham,[11] in a discussion on collaboration between countries in the Global

South and triangular cooperation with partners in developed countries, raises critical questions about the drivers and benefactors of such an undertaking and whether the less advantaged are adequately included in the process. These studies highlight the unequal power relations which are prevalent in many research collaborations, especially where skills and capacity development is a goal of such engagement. Furthermore, the researchers did not explore the personal capabilities and conversion factors impacting research collaboration, especially following the bottom-up, subjective explanation as argued by Adams et al.[8]

Ibrahim[12] highlights the importance of power relations in human development studies by applying the capability approach (CA). Boni and Walker[13] identify research and knowledge generation as areas where the CA can be applied to investigate human development. Against this background, the purpose of the study is to 'identify the main components of and factors that impact research collaboration in asymmetrical power relations in South Africa'. The authors use Robeyn's capability input diagram (see Figure 1) to unpack their findings towards presenting the main research collaboration components and factors that impact research collaboration from a personal capabilities perspective. The perspectives of master's, doctoral and postgraduate students (also known as novice researchers) are significant as they represent the future generation of research collaborators,[14,15,16] yet extant studies have not considered their voices in this regard.

This interpretivist study was conducted using a case study research design. The context was Southern African postgraduate students in the field of information and communication technology for development (ICT4D). The exploratory data capturing involved surveys and focus group discussions (FGDs) with ICT4D postgraduate students in 2019.

In the next section, an overview of research collaboration is presented, which is followed by an overview of the CA and then the research context. Thereafter, the research design is explained, the findings are presented and the article is concluded by looking at the limitations and the research contribution.

Review of related literature
Research collaboration

Collaboration in academia has been defined in many ways. According to Cataldi et al.,[17] research collaboration is a two-way process in which individuals and/or organisations share learning, ideas and experiences to produce joint scientific outcomes. Sooryamoorthy[7] adds the requirement that relationships be well defined and mutually beneficial. Besides collaboration between researchers as colleagues, there have long been supervisor–assistant, researcher–consultant and interinstitutional collaborations. In general, research collaboration involves a project based on the interaction between a university researcher and another partner, where the partner is another university researcher, a company representative (as in the case of university–industry collaboration) or an organisation (in the case of a university collaborating with provincial and federal government agencies, local governments or other organised interest groups).[6] Collaboration can be theoretical, as in the rendering of advice, ideas and criticism, or technical, as in providing tangible assistance in a research endeavour. In many cases, collaboration contains elements of both.

Given the link between high levels of collaboration and scientific research productivity, many developed countries seek to stimulate collaboration through a mix of research grant schemes and grant criteria designed to fund collaborative research.[1] Those initiatives have experienced challenges, and the tension between research policy settings (based on particular models of collaboration) and heterogeneous research practices have spurred research into various aspects of research collaboration.[4] A substantive investigation into research collaboration models and related aspects are beyond the scope of this article; therefore, only the product versus process dimension and the reasons for collaboration will be discussed.

Lewis et al.[1] distinguish between *fluid, expressive* and *concrete, instrumental* collaboration, noting that the two are not mutually exclusive and their use varies from one discipline to the next.
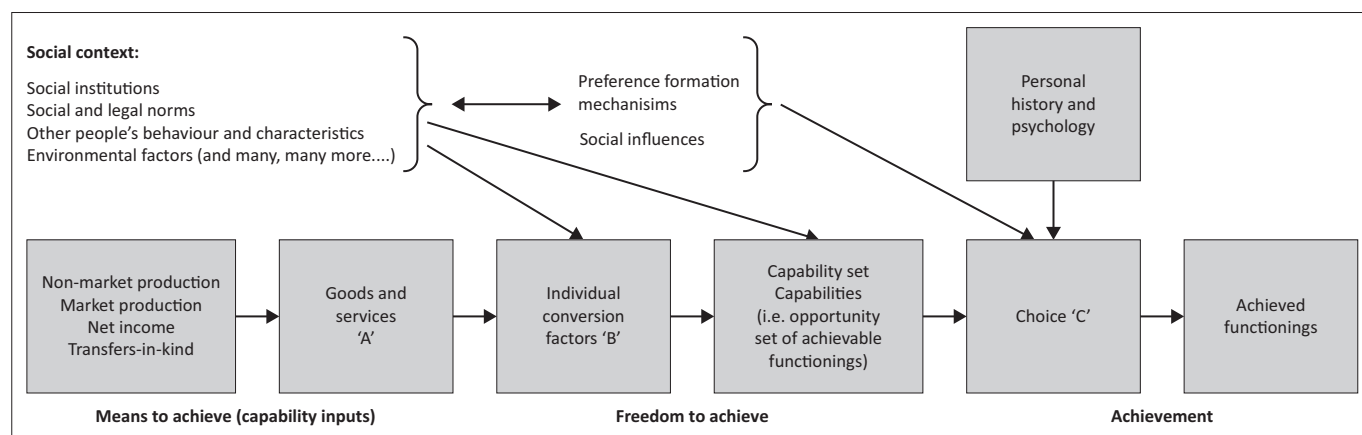
Source: Robeyns I. The capability approach: A theoretical survey. J Hum Dev. 2005;6(1): 93–117. https://doi.org/10.1080/146498805200034266
FIGURE 1: Based on Robeyns'[39] stylised nondynamic representation of a person's capability set of social and personal context.

Arguably, the former (fluid and expressive) can be seen as the process perspective, whereas the latter (concrete and instrumental) fits the product perspective. Kumar and Ratnavelu,[18] who studied scholars from 69 countries in the field of economics, found that respondents considered the improved quality of the outputs, the contribution of mutual expertise and the division of labour to be the biggest advantages of, and motivations for, co-authorship.

Researchers' engagement in collaborative activities are motivated by a multitude of factors which can be grouped under the categories of *personal*, *social* and *environmental*. *Personal factors* include intrinsic motivation, researcher characteristics and individual behaviour.[19] Researchers were found to associate, to varying degrees, with other scholars based on socio-academic parameters such as nationality, ethnicity, gender, professional position and friendship.[18] A broader view includes the ability to access expertise and resources, exchange ideas, learn new skills, ensure personal compatibility, garner prestige, establish trust, expand knowledge, foster self-efficacy and strengthen capabilities.[20,21,22,23] *Social factors* comprise productivity, association with a prominent co-author, cultural diversity, gender, communication and membership of a researcher's social network.[21,22,23,24,25] *Environmental* (also referred to as institutional) *factors* encompass higher-quality results, access to funding, the pooling of expertise for solving complex problems, top management support, disciplinary measures, detailed supervision policy and rewards.[19,21,22,23]

Personal factors motivate a researcher to engage in collaborative activities, while environmental and social factors strengthen collaboration.[21] Collaboration is strengthened through formal and informal meetings and activities.[21] Cottrell and Parpart[10] and Van den Hoven and Connell[25] concede that collaborators might experience problems regarding the ownership and identity of the research output, transparency, financial issues, power imbalances and the processes followed to reach mutually agreed objectives.

This section highlighted core aspects in the theorisation on research collaboration, and the next section motivates the relevance of the application context, namely ICT4D for research collaboration.

Research collaboration in information and communication technology for development

Information and communication technology for development is an interdisciplinary field concerned with the use of information and communication technologies (ICTs) for international development;[3] thus, the research methodologies are multi-, inter- and transdisciplinary in nature. Historically, ICT4D grew out of attempts by researchers and organisations in the Global North to use emerging computing technologies to improve socio-economic conditions in developing countries (generally located in the Global South).[26] North–South research collaboration has thus been fundamental to ICT4D research and knowledge production.

According to the social network analysis of researchers at the International Conference on Information and Communication Technologies and Development (ICTD), there are fewer collaborative ties among academic institutions in developing countries.[27] Bibliometric studies provide further evidence that collaboration between African countries is weak and that regional integration of collaborative research networks is lacking.[28,29,30] Toivanen and Ponomariov[28] found Europe to be Africa's largest collaboration partner in terms of research outputs, while South Africa and Nigeria were the leading research countries in Africa and integrative hubs in their respective regions (Southern and Western Africa). By contrast, Adams et al.[8] found the countries collaborating most frequently with partners in Africa to be the United States, France, the United Kingdom, Germany and Canada. Furthermore, they found that collaboration patterns for countries in Africa exhibit layers of internal clusters and external links that cannot be explained by monotypic global influences but rather by regional geography, history, culture and language.[8]

In summary, extant findings on research collaborations in Africa indicates mostly intra-institutional collaboration or collaborations with countries outside of Africa. Involving researchers from the application context can improve the authenticity of the findings, given that South Africa has been identified as the main research hub in Africa.[28,29] Locally, there has been an increase in the university student population as a result of the affirmative action policies by the National Student Financial Aid Scheme (NSFAS).[31] Maluleka et al.[32] found that in South Africa, especially in an ICT4D field, the majority of the staff members in the academic department of the university were novice researchers.

Despite the dynamic research context and the prevalence of novice researchers (postgraduate students), there is little evidence of studies into the factors influencing this cohort's collaboration at South African universities, let alone an investigation that applies the CA to human development in the context of novice researchers in South Africa as one of the hubs for research collaboration in Africa. Against this background, the authors argue that the capability set of postgraduate students, as the future research generation, should be investigated and that South Africa provides an appropriate context.

The capabilities approach

According to Boni and Walker,[13] '[h]uman capability formation is human development'. The CA offers an explanation for human needs that goes beyond economic utilitarianism by placing people at the centre of the development process and drawing research attention to sustainable human development.[33] Not wanting to simplify complex phenomena or debates, the authors will highlight selected key concepts here to analyse the empirical case, including brief references to Sen's[34] CA and its application in education, research collaboration and policy formation.

Sen's CA[34] is a broad, normative framework for the evaluation and assessment of individual well-being and social arrangements that enable individuals to live meaningful lives. The major constituents of the CA are the interrelated concepts of functionings and capabilities, where functionings (also known as achievements)[35] are the 'beings and doings' of a person, and capability is 'the various combinations of functionings that a person is able to achieve'.[36] Education is regarded as a core capability, fundamental to enhancing other capabilities and well-beings.[37,38]

Unpacking the CA for the design of policies and proposals related to social change in society, Robeyns[39] depicts the different roles of education by means of a stylised, nondynamic representation of a person's capability set and his or her social and personal context. Of interest as regards research collaboration is the relationship between commodities (goods and services), functionings and capabilities, and the extent to which people can generate capabilities from goods and services. Robeyns' diagram[39] as depicted in Figure 1 is thus applicable to research collaboration as follows.

Research collaboration involves several capability inputs that a researcher ought to have; these include educating, writing, engagement and argumentation.[25,38,40,41] Delving deeper into the capabilities, the authors identify that issues such as history, culture, language and regional geography[8] affect researchers' writing as they require command of the language (grammar, spelling and sentence formulation) and research skills. The research skills may include the ability to command the chosen philosophy, methodology, data collection and analysis skills (including tools and techniques) and the command of ethics. Towards involving the social context, researchers can share their work within the department, in workshops and conferences and specifically with novice researchers conducting a proposal defence and viva.

The CA focuses on the process of expanding people's real freedoms so that they can live the kind of lives they have reason to value.[42] The kind of lives will be influenced by their capability inputs, social context, personal history and psychology. The functions of a research collaboration include publishing, graduating, being literate, being part of a community, being educated and networking. The relation between a *good* (personal property or service) and the *functionings* needed to achieve certain beings and doings is influenced by three groups of conversion factors: the personal, the social and the environmental.[34]

Postgraduate students' research collaboration contexts, delineated by the personal, social and environmental conversion factors, can be unpacked as follows: *personal conversion factors* refer to students' mental and physical condition, literacy, intelligence, gender, affiliation, emotions and so on. *Social conversion factors* refer to public policies (such as Goal 17 of the Sustainable Development Goals [SDGs], the South Africa National Development Plan [NDP 2030] to increase the number of graduates by producing more

than 100 doctoral graduates per million per year by 2030),[14] research and supervision policies, social norms and practices, gender roles, discrimination practices, societal hierarchies and power relations which play a role in the conversion from the characteristics of a 'good' to its individual functioning. Introducing the idea of *network weaving* to foster resilience and sustainability in ICT4D research, Marais and Vannini[43] claim that ICT4D would benefit from intentionally growing social capital and fostering networks within its systems.

Environmental conversion factors include geographical location, which considers the crime rate in some cities and how it may deter collaboration, and the presence of power rationing, which affects some cities in the country more than others. Environmental conversion factors also include issues such as climate and infrastructure, which can affect the conversion from a characteristic of goods and services to individual functioning (e.g. enrolling for distance learning if the geographical location impedes face-to-face tuition).

The significance of research collaboration for capabilities can be conceptualised in terms of enhancing individual conversion factors ('B' in Figure 1). Dejaeghere[37] mentions two groups of educational capabilities which are found in CA scholarship: affiliation, social networks and recognition; and critical thinking or practical reasoning, aspirations and the reimagining of alternative futures. A basic example is how science literacy enables an individual to convert the resource of an academic paper into information and knowledge (statistical knowledge and scientific reasoning enable an individual to read it critically). By developing reasoning skills, education also influences how individuals make good (or better) choices in respect of particular functionings ('C' in Figure 1).

In accordance with the normative aspect of the CA, research collaboration should be guided by a concern to expand individual capability sets. The CA takes account of human diversity in two ways: firstly, by focusing on the variety of capabilities and functionings as the evaluative space, and secondly, by explicitly focusing on personal and socio-environmental conversion factors converting commodities into functionings, and on the whole social and institutional context that directly affects the conversion factors and also the capability set.[44] For postgraduate students, research collaboration has a developmental agenda in terms of human capacity since it can be agency or well-being enhancing. The preferences that influence an individual's choice of functioning will have been influenced and formed by his or her social context, personal history and psychology.

As mentioned, research collaboration can be deemed either a product or a process. The product view (which connects to the functionings) focuses on research collaboration as an artefact of institutional policy or funding agency grants, with measurable outcomes such as interinstitutional agreements, publications, students graduating and so on. The process view adopts a relational ontology to account for the power constituted in social relations and structures, the researchers' internal processes and the external processes needed to

deliver envisaged outcomes. The latter presents the fact that research collaboration is valued for personal development, which cannot be measured in terms of research outputs.

Against this overview of the CA, the authors focus on investigating students' personal capability set that could support human development. The next section describes the context followed by the philosophical assumptions that guide the study; motivates and explains the research design and data-capturing strategies; and details the way in which the research was done.

Research context

Supervision relationships are asymmetrical by design. Supervisors generally have more knowledge and experience than the student in the research area and often more access to resources. The latter is specifically true in South Africa, a country with major socio-economic inequalities.[45] The NSFAS was introduced in 1999 to provide financial aid to students from poor and working-class families to promote access to, and success in, higher and further education and training.[46]

Socio-economic inequalities, together with the provision of financial support for historically disadvantaged students, mean that many of them are the first members of their family to obtain a degree and enrol for postgraduate studies. The now-abolished political system of apartheid, which led to the institutionalised, race-based disadvantaging of nonwhite groups in South Africa, had negative consequences for human capacity development. That legacy, coupled with the 2018 parliamentary decision to increase the scope of NSFAS aid, underlies the imbalance in power relations between supervisors and students. Thus, the case of South African student–supervisor collaborations in 2019 is unique and timely to investigate.

Research methods and design

There is no standard or exclusive procedure for 'translating' the theoretical level of the CA into its empirical counterpart.[47] Frediani et al.[48] support that line of argumentation, describing the CA as a broad 'methodological approach' that needs to recognise compatible technical methods and partner with those to compensate for its own limitations. Researchers therefore have to select from the variety of alternatives that can be implemented, depending on the aim of the research and the resources available.[41]

This study followed the philosophical assumptions of interpretivism, which are based on the premise that our knowledge of reality is a human social construct.[49] This aligns with the purpose of the investigation, where the social context was imperative. Furthermore, the use of interpretivism aligns with Adams et al.,[8] who suggest that research collaboration solutions for Africa should use a subjective philosophy.

Case study research is advocated for understanding a real-world phenomenon when it involves important contextual conditions which are pertinent to the case.[49,50] This applies to the current study, that is, seeking to understand novice researchers' asymmetric power and factors in respect of their collaborative research. Postgraduate students undertaking master's, doctoral or postdoctoral fellowships are the units of observation and analysis, and the terms 'students', 'participants', 'junior researchers', 'young researchers' and 'novice researchers' are used interchangeably to refer to the participants in this study.

Scope

Data capturing was limited to postgraduate students undertaking master's, doctoral studies and postdoctoral fellowships in the field of ICT4D at South African universities. The focus was on students' perceptions, but supervisors' inputs were considered when they were available (during an ICT4D chapter launch) and found useful for understanding issues related to the conversion and collaboration factors.

Data capturing

- In July 2019, exploratory data were captured during the chapter launch of the international network for postgraduate students in the area of ICT4D (IPID) in Southern Africa. The event was hosted in the Gauteng province of South Africa.
- The attendees hailed from six institutions (five universities across South Africa, plus the National Research Foundation). The participants represented six different countries in Africa, including South Africa, Uganda, Kenya, Nigeria, Tanzania and Namibia. The presence of the novice researchers in South Africa speaks to the value that South Africa has in fostering their academic development, including access to resources, finances and knowledge, and supports with the claim that South Africa is the hub for research in Southern Africa.
- A hard copy of a questionnaire containing seven open-ended questions on research collaboration was handed to 38 junior researchers (master's and doctoral candidates and a postdoctoral fellow) and 5 senior researchers (associate professors and professors) with the request to complete it. After 35 min, all participants had completed the questionnaires. Thereafter, they were asked to form groups of five or more individuals, so that each group included master's and doctoral students.

The senior researchers formed a separate group. The groups engaged with the same seven questions (from the questionnaire) in FDGs lasting between 30 min and 45 min. Each group had a coordinator who facilitated the discussion and audio-recorded the discussion using a smartphone. The coordinator would pose questions (from the questionnaire) to the group and entice engagement from the FGD members. For the novice researchers, each group had a coordinator who was a fellow novice researcher. For the senior researchers, the coordinator was also a senior researcher. The intention of using peers was to reduce power imbalance and afford open discussions. Although the CA informed the

authors' thinking on identifying concepts related to research collaboration, the questions were not formulated in terms of CA terminology, as the authors could not assume that the participants were adequately familiar with the terminology of capabilities, functionings and conversion factors (see Questionnaire in Appendix 1). The majority of the questions formulated targeted an understanding of the conversion factors (personal, social and environmental). The purpose was to use these constructs during the data analysis to abstract and present the capabilities and functioning from the novice researchers' perspective.

Data analysis

The authors followed the six-phase thematic analysis, advocated by Braun and Clarke,[51] to analyse the FGDs and responses to the open-ended questions. The phases can be described as follows:

- The first phase, familiarisation with the data, began with an edited transcription of the recorded FGDs. A research team member transcribed all three focus group (FG) interview recordings. Each questionnaire was given a unique identifier and scanned to retain a digital copy of the responses. All the transcripts (from the FGDs and open-ended questionnaires) were loaded on ATLAS.ti version 8 (ATLAS.ti GmbH, Berlin, Germany), and the researchers read and reread the transcripts to understand the breadth and depth of participants' contributions from the FG.
- The second phase involved generating initial codes on the transcripts, assigned to a sentence or paragraph, to address the research questions. The authors did not have an externally created code list. Initial codes included 'challenges of research collaboration', 'conditions for research collaboration', 'intention to collaborate' and 'benefits of collaborations'. The researchers also took note of tensions (contradictions) in the transcripts, as the participants engaged with the questions.
- The third phase involved searching for themes and engaging with the initial codes (from the second phase) by collating all related, relevant data extracts. Related codes were connected using networks on ATLAS.ti, and a code group was created to link them. A few initial codes were grouped under 'miscellaneous', since they did not fit into any of the related codes. At this stage, the code groups were referred to as *themes*. Examples of themes emerging during this phase included 'common understanding', 'roles and responsibilities', 'distribution of intellectual property' and 'publication credits'.
- The fourth phase focused on refining the code groups, with each being assessed for internal homogeneity and external heterogeneity. In the process, the researchers coded more data extracts (returning to the second phase) in a recursive manner, based on new ideas that emerged while reviewing the themes. The fifth phase involved defining and naming themes obtained during phase four. The themes (including subthemes and counterarguments) were reconsidered in terms of their contribution to the broader perspective of research collaboration.
- The sixth phase involved producing the research report – a complete data-based story to allow the reader to understand the merit and validity of the analysis. The current study represents phase six of the thematic analysis.

Ethical considerations

Ethical clearance (ref. no. 2019_RPSC_037) was obtained from the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee and the Research Permission Sub-Committee (RPSC) of the Senate Research, Innovation, Postgraduate Degrees and Commercialisation Committee (SRIPCC). Each participant was requested to read and sign the ethics consent form before the questionnaire was distributed. Participant names were not captured, so responses cannot be traced to any individual person.

Findings and discussion

The following main themes emerged from the thematic analysis (followed by the number of occurrences in brackets): *common goals (51)*, *transparency (30)*, *finance (98)*, *knowledge sharing (107)*, *institutional requirements (86)*, *diversity (54)* and *power imbalance (59)*. Knowledge sharing and finance being the most mentioned relates to the reasons for collaborating, while the other themes relate to the factors that support or hinder collaboration.

The themes are multidimensional in terms of having personal and *institutional* aspects and *constraints*. The personal dimension focuses on what an individual values and views as important in a research collaboration. The institutional dimension considers the policy, resources and any documentation that goes beyond the personal dimension and is bound (or restricted) by the researcher's affiliation. The constraints refer to challenges that researchers are encountering in creating, engaging and ensuring they have a sustainable collaborative working space. The differentiation of the different dimensions is crucial, as it allows for data to show the transition of the personal to the institutional issues and accounts for any challenges encountered, which connects to viewing a research collaboration as a process. The themes and dimensions are now presented, supported by quotations and linked to the extant literature where relevant. Data from FG are identified by a number for each FG (i.e. FG1, FG2 and FG3). FG3 represents the FGD among supervisors. Questionnaire data are noted as 'Q', followed by a number for each analysed questionnaire based on the unique identifier.

Common goals

The researchers identified the need for a common understanding of what research collaboration requires, what roles and responsibilities each researcher or institution

should have, and how intellectual property and publication credits are distributed.

Personal goals

'[…*F*]rom the onset, having that discussion to state what are the actual benefits, and then allowing rooms for continuous engagements to go through those expectations …' (FG2)

Institutional goals

'[…*S*]o it is better to be upfront and put forward to say that these are my institution policies and vice versa.' (FG1)

Constraints

'What I think is that if I want to collaborate with you there might be what I want to achieve through my sponsors. So you might see literally when I want to discuss this topic, but the way I understand it, my financers or people who are sponsoring me will understand it different from you. So there is nothing you can do to have a common ground …' (FG1)

Noticeably, in some cases these common goals may be affected by the demands of supervisors, sponsors and organisations assisting the researchers. Freshwater et al.[52] concur with these findings, mentioning a 'consensus approach to decision-making'.

Transparency

The researchers argued that each party involved in collaborative research had to be clear not only on their common goals but also on the expected benefits. At an institutional level, the use of a memorandum of understanding (MoU) was proposed as a tool for researchers to work towards common goals.

Personal

'So, I think if we are transparent that, yes there is a common but here are my intended benefits – whether it's financial or otherwise - if we disclose that upfront at least I know that my contribution comes from my heart rather than an embedded expectation.' (FG1)

Institutional

'Having the MoU upfront about those things may be helpful.' (FG3)

Constraints

'Let's say I found certain findings that are opposite to what the company that is funding you is saying. And then these people are saying no you mustn't write these results, you must look for the results that speak to our agenda.' (Q17)

A sponsor's agenda was perceived as a possible obstacle to providing credible, empirical evidence. Concerning student–supervisor collaboration, there should be a contract outlining action plans, intentions and expected outcomes before commencing the collaboration – an argument that Van den Hoven and Connell[25] accept.

Finances

Funding is an essential component of most collaborative research projects. It is associated with the cost of data collection, data analysis, acquiring tools and travelling. Travel may involve visiting a location for data collection or attending conferences.

Personal

'Research collaboration could maybe provide funding to travel.' (Q12)

Institutional

'It is difficult to have fundamental access to resources, journals, journals database, [*Et cetera*] Students cannot access because institutions cannot afford into the journals. All they do is doing profit. But we can't read our colleagues work.' (FG3)

Constraints

'In a case where finances are not balanced, I believe success will be limited; especially in a case where the researcher is sponsored by a particular organization they may be required to report results that are beneficial to the particular company.' (Q9)

'We have no funding to attend conferences.' (Q8)

'We have no access to the fund, yet our full input is required during the inception.' (Q8)

The findings on the importance of the availability and management of funding during a research collaboration are in line with those reported by Cottrell and Parpart,[10] Freshwater et al.[52] and Van Biljon and Naudé,[53] where finances were found to play a crucial role in collaborative endeavours.

Knowledge sharing

A lack of experience, few publications, limited research networks and being ill-equipped to operate in a multidisciplinary collaborative space were cited as barriers to research collaboration.

Personal

'The challenge that I think we are experiencing as emerging researchers; you will find that the people who are already well established do not want to collaborate with us. Because the information is only going in one direction, they don't gain anything. […] So, if they are working with an emerging researcher, they know that you are dragging them and going to ask too many questions.' (FG2)

Institutional

'Because for projects you need people from multi-disciplines – technologies, sociologists, etc. Then when you collaborate you can't be master of all trades.' (FG3)

Constraints

'I think also just to hub on the knowledge side, it is really a case of "you know what you know" and "you don't really know what you don't know". In that collaboration space, it gives you that ability to

actually test what you don't know, and obviously once an acknowledgement is there you are the one that actually knows and there is actually new knowledge that is being generated.' (FG2)

Knowledge sharing allows novice researchers to test new ideas, concepts or arguments and acquire feedback that will assist them in better understanding their area of specialisation. Tan[23] concurs that research collaboration is strongly influenced by knowledge sharing, whereas the latter is influenced by trust, organisational rewards, the organisational culture, the quality of the knowledge management system, openness in communication and face-to-face interactive communication.

Institutional requirements

Institutional requirements relate to the research policies which guide the credits and rewards afforded to joint publications, external supervisors and collaborative programs (e.g. visiting researchers).

Personal

'[…F]or example, our papers are marked by external examiners. So, if I get an external Wits [*the University of the Witwatersrand*] perspective and maybe my paper is going to be marked by a Wits lecturer I mean it is quite beneficial for me to sort of understand how Wits perceive writing styles or expectations out of your research paper. Unless if there is a standard in research on how you should research terms of what is expected.' (FG2)

Institutional

'In terms of institutional practices and background, I think ethics can be different… For example, in terms of let's say when you are conducting research, some institution may have to incentivize that research giving people gifts etc., whereas some institutions do not allow researchers to give out any gifts, data etc. I think that could be a challenge in my perspective.' (FG2)

Constraints

'[…L]ike the issue you pointing out of students not getting informed about certain things, I find that a lot of time maybe we tend not to read through the websites, [*Et Cetera*] because a lot of information is there but we tend to mostly rely on what did the next person tell me about.' (FG2)

The participants noted that much of the information (issues relating to intellectual property, the application of ethics and incentives) about research is found on the university website but that they prefer to consult colleagues instead of university information structures. Based on a study of research collaboration at Kenyan universities, Muriithi et al.[19] identified the need for institutions to improve their communication on intellectual property and ethics-related policy requirements. This is echoed by a study conducted at South African universities, where differences in assigning intellectual property rights, funding models and research collaboration histories were identified as barriers to collaboration.[53]

Diversity

The participants' comments related to cultural differences or differing contexts were combined under the heading 'diversity'. Increasing diversity in terms of demographic and knowledge levels within research teams has been proposed as a worthwhile goal. However, the findings of this study show that cultural norms can have a negative effect when they overshadow the expectations of the collaborative space, to the extent where research collaboration is inhibited.

Personal

'This brings blended research ideas, with different perspectives and ways of thinking; because of different backgrounds and environments we grew up in.' (Q7)

Institutional

'I think we have different cultures in general. I think it's good because it neutralizes the bias. If I publish and not mention you then you would be neutralized. But if you are from my culture you will understand that woman don't do partnership.' (FG1)

'I think fully I agree with you where cultural differences being seen in terms of strength. In fact, if you go back from one of the information system perspective, we know that the most successful teams in projects are those where the members of the team are from diverse backgrounds.' (FG3)

Constraints

'I think there is a huge bias when it comes to collaborations. Almost all of us, we try collaborations with researchers from Europe.' (FG3)

Respecting diversity successfully means understanding the expectations and capabilities of the participants well enough to create opportunities to collaborate within the scope of their capabilities, expectations and aspirations. Muriithi et al.[19] provide evidence that despite diversity among participants, those involved in collaborative endeavours published more than their counterparts, which clearly shows the benefit of a culture of research collaboration. The need for contextual and cultural differences to be managed as part of research collaboration confirms the findings of Freshwater et al.[52] and Cumming.[54]

Power imbalance

The consequences of a power imbalance were a pervasive theme. Arguably, some institutions have facilities and resources that others might not, and these can be used to benefit those undertaking collaborative research. Conversely, a power imbalance may work to the detriment of researchers or institutions, as the focus of the research collaboration can be influenced by the funders or interests of the better-resourced partner(s).

Personal

'It depends on stakeholders how they use that power imbalance.' (FG2)

'Power imbalance could be good, in the sense that you might have all the knowledge and I can learn from you, but you can also learn from me.' (FG1)

Institutional

'You might have to conflict your interest or way of thinking or doing things, that you are interested in this particular project but your funder or organisation you are working with has other interests …' (FG2)

Constraints

'These things are happening; I have had a situation where some piece of my writing was presented by my supervisor in a conference without my knowledge.' (FG1)

The perception of unequal power distribution was evident in the relationships between participants and their supervisors. Based on a study of collaboration between academics and communities, Cottrell and Parpart[10] report evidence of a power imbalance resulting from financial demands and politics on various levels and argue that power imbalances are prevalent in research collaborations, whether explicitly stated or appearing as differences in class, race or culture.

Reconsidering Robeyns' representation of a person's capability set in the light of the findings of the present study (see Figure 2), the required capability inputs are relevant expertise, knowledge and skills, cultural awareness, educational and research institutions, infrastructure and funding. The conversion factors that will influence the individual's capability set derived from the capability inputs are the social, environmental and the personal history and psychology. The main contribution of the findings lies in the identification of collaboration factors, that is, having common goals for the collaboration, transparency in the agendas, processes and resource allocation, knowledge sharing between researchers, acceptable diversity management and power balance management. The themes 'institutional requirements' and 'finance' influence the collaboration but are already represented in the capability inputs. The themes of common goals and transparency may be more relevant on a personal level, while the themes of knowledge sharing, diversity management and power balance management are relevant on a social level.

The functionings that novice researchers may realise include graduating, publishing, having academic dexterity and being part of a community of ICT4D researchers for networking.

Limitations

As a result of the limitations hampering the direct measurement of capabilities, most research focuses on the achievement of functionings.[47] In this study, the collaboration factors were based on students' perspectives and thus suffer from the limitations of self-reporting. Because of distance and accommodation costs, many students and supervisors outside of Gauteng could not attend the chapter launch, and that limited the number of responses. Although the postgraduate student cohort included six nationalities, the South African students were in the majority (more than 60%). Therefore, the findings cannot be generalised to those countries and more research is needed to investigate research collaboration in other African contexts.

Sen's CA[42] is difficult to navigate and focuses on individual rather than collective choice;[55] therefore, the authors limit this study to the individual's choices. To collaborate is a personal choice but not divorced from the collective; another theoretical lens could make it easier to unpack the collective aspect beyond classifying it under social conversion factors. Network weaving towards fostering resilience and sustainability in ICT4D, as advocated by Marais and Vannini,[43] could provide theoretical and practical guidance on fostering future research collaborations.

Conclusion

Research collaboration has the potential to promote human development while improving research impact by providing the diverse expertise required for interdisciplinary research projects. The lack of research collaboration in ICT4D, as is evident in bibliometric studies of developing countries and
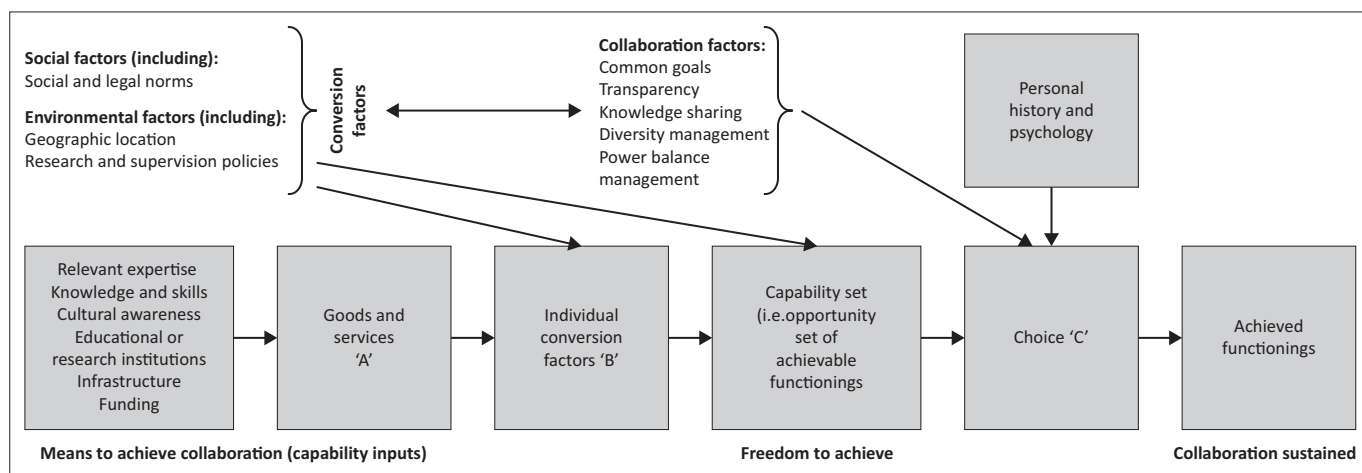

FIGURE 2: Main components and factors in the process of research collaboration, adapted according to the findings.

specifically in South Africa, signals untapped potential and the need to better understand the factors influencing research collaboration.

Applying the CA, specifically Robeyns' focus on personal capability inputs as a theoretical lens, offers a broader vision of research collaboration, with a focus on improving human well-being and agency in the context of unequal power relations between senior researchers (supervisors) and novice researchers (postgraduate students). Besides the methodological novelty of applying the CA to the research collaboration space (previously dominated by bibliometric studies), there is the theoretical contribution which consists of the identification and conceptual presentation of the main components and factors that govern postgraduate students' agency in terms of collaboration. The findings of this study confirmed the elements of a *common endeavour* and *transparency* and added *shared ethical values*, *knowledge sharing*, *respecting diversity*, power *balance management*, *access to research environment*, *tools and opportunities* and *orientation and training* as factors influencing research collaboration.

Besides general respect for humanity, the study participants did not consider a partnership among equals to be a prerequisite for successful collaboration. They considered asymmetrical power relations as something to be managed rather than something to be avoided. Some participants considered a power imbalance as inevitable in triggering a collaboration that involves the sharing of knowledge and access to resources in collaborative endeavours. This finding could be influenced by the transference of the asymmetrical power relations (even if only in terms of supervision experience) inherent in supervision relations. The research collaboration factors are proposed as a point of departure for further investigation in inter- and transdisciplinary research settings, rather than as a final, prescriptive determination.

The findings suggest that novice researchers have a restricted expectation of research collaboration, which would inhibit them from promoting collaborations at a national or international level. Novice researchers advancing their research ability to becoming senior researchers and helping other novice researchers may be hampered by the view that research collaboration should focus on the engagement with the supervisor. To this extent, novice researchers may struggle to build collaborative networks with colleagues within the department, institution(s) and even within Southern African countries.

This suggests the need to reassess the current qualification and publication-based perception of research collaboration, to investigate the potential for promoting the core values of well-being, participation, empowerment and sustainability that underlie capability enhancement and human development. The practical implications for policy and practice are that supervisors' involvement should be considered in collaborative initiatives. The expressed preference to collaborate with a scholar who is either more senior or better established provides some explanation for the lack of mutual regional research undertakings, since researchers from more developed countries are perceived as having more agency in terms of knowledge and other resources. Further research is needed to verify the generalisability of the findings to other contexts and international collaborations and to include the perspectives of university managers, funding agencies and other stakeholders.

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Appendix 1
Research Collaboration Questionnaire

Dear Researchers,
Please respond to the following questions by writing your response next to or below the questions provided:

1. What do you think would be the general expectations from research collaboration with other ICT4D students, supervisors and mentors?
………………………………………………………………………………………

2. What are your specific expectations of the collaboration with other ICT4D students, supervisors and mentors?
………………………………………………………………………………………

Do you think that research collaborations are more successful if there are power imbalances, that is, large differences in the intellectual, financial or other capabilities of the participants?
………………………………………………………………………………………

3. Research collaborations harbour challenges. Please provide more detail on what you see as the most important regarding the following aspects of collaboration.
4. Financial
5. ………………………………………………………………………………
6. Differences in knowledge background
7. ………………………………………………………………………………
8. Differences in institutional requirements and practices
9. ………………………………………………………………………………
10. Differences in cultural background
………………………………………………………………………………………

11. Initiatives that would be useful in establishing research collaborations
………………………………………………………………………………………

Any other information that you believe is important in establishing and maintaining sustainable research collaborations.